Disc Herniation Induces 55% Increase in Multifidus Load in Axial Rotation

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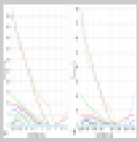
General Information

Abstract Title:	Disc Herniation Induces 55% Increase in Multifidus Load in Axial Rotation
Study Design:	Laboratory Investigation (Spine)
Preferred Format:	Oral Abstract
Subject Category:	
Award Consideration:	

Scientific Content

Introduction:	The multifidus is a key stabilizer of the spine[1], especially in axial rotation[2]. Its loss of size has been shown in patients with symptomatic herniations[3]. Cadaver testing has shown that herniations significantly decrease the segment stiffness in axial rotation[4]. We hypothesize that this loss of segment stiffness results in an overload of the multifidus, leading to muscle atrophy. The purpose of this study is to examine the mechanical effect of a lumbar disc herniation, via the loss of segmental stiffness in axial rotation, on the force required by the different branches of the multifidus.
Methods:	We used the AnyBody Modeling System™, a validated model[5,6] consisting of more than 1000 individual muscle branches to analyze flexion-extension, lateral bending and axial rotation motion of a standing adult under the influence of gravity (Fig. 1). Simulations were run using segment stiffness at L5-S1 from cadaver test data for normals and for herniated segments[4]. The analyzed parameters were the forces in all branches of the multifidus muscles of the model on the right side of the spine.
Results:	The herniation did result in significant increases in the force in the multifidus. The greatest impact was in axial rotation, where there was a 55% increase in force in a multifidus branch crossing the effected segment (Fig. 2). Lesser impact was seen in flexion-extension (maximum 33% increase), and a small decrease was seen in lateral bending.
Conclusions:	The mechanical effect of the herniation on the multifidus was greatest in axial rotation, significantly increasing the peak load required by branches of the multifidus crossing the herniated level. This overload may be a cause of muscle atrophy in patients with herniations. Limiting motion in axial rotation may be required to protect the multifidus from atrophy in patients with herniations.
Learning Objectives:	By the conclusion of this session, participants should be able to understand the role of the multifidus and the impact of a herniation on the multifidus.
References:	multifidus, herniated disc, biomechanics, axial rotation
How will your research improve patient care:	This research will improve patient care by improving the understanding of the impact of herniations on other structures in the spine and may lead to improved treatments to minimize this impact.

Attachments:

	**Title:**Fig. 1. AnyBody model. **Caption:**
	**Title:**Fig. 2. Multifidus branch loads, normal (a) and with herniation (b) **Caption:**

Authors:

Author	Disclosure	Presenting	Corresponding	CoAuthor
Bruce Robie	ARO Medical, LLC,Primary,Ownership Interest,CEO	X	X	
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